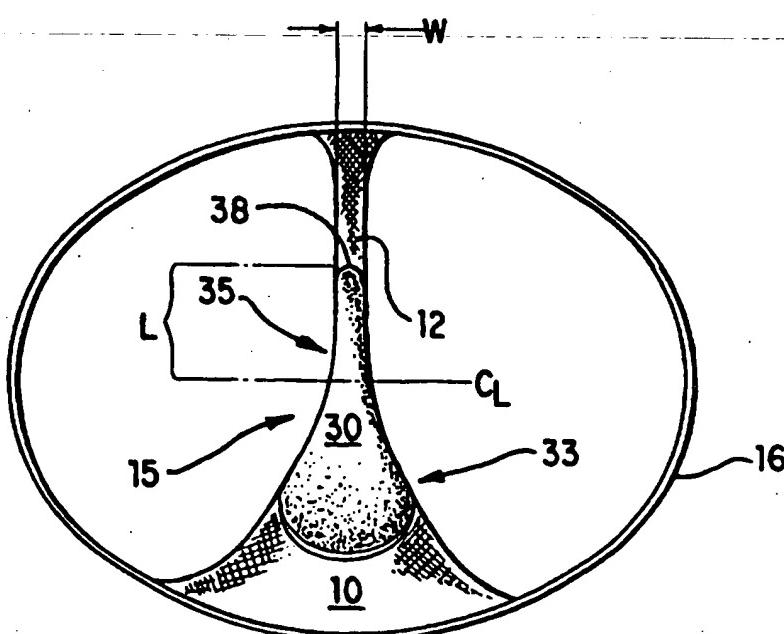


PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: A61F 13/15, 13/20		A1	(11) International Publication Number: WO 97/39713
			(43) International Publication Date: 30 October 1997 (30.10.97)
(21) International Application Number: PCT/US97/06826		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GI, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 21 April 1997 (21.04.97)			
(30) Priority Data: 08/636,001 22 April 1996 (22.04.96) US			
(60) Parent Application or Grant (63) Related by Continuation US 08/636,001 (CIP) Filed on 22 April 1996 (22.04.96)		Published <i>With international search report.</i>	
(71)(72) Applicant and Inventor: DARBY, Karmela, J. [US/US]; 10275 Seagrape Way, Palm Beach Gardens, FL 33418 (US).			
(74) Agents: HANDELMAN, Joseph, H.; Ladas & Parry, 26 West 61st Street, New York, NY 10023 (US) et al.			
(54) Title: FEMININE PAD SHAPED FOR USE WITH A THONG GARMENT			
(57) Abstract			
<p>A feminine sanitary pad (30) shaped to fit the contours of a thong style garment (10) from the front of the wearer of that garment to beyond the crotch of the wearer. The pad is generally "V" shaped, so that the vertex (38) of the "V" can be positioned below and externally of the vagina of the wearer. The lower end portion (35) of the pad is uniform in width along the greater portion of its length.</p> 			

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KF	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Libera	SG	Singapore		
EE	Estonia						

FEMININE PAD SHAPED FOR USE WITH A THONG GARMENTBACKGROUND OF THE INVENTIONTECHNICAL FIELD

This invention relates to sanitary pads designed to receive and contain vaginal discharges such as menses and more particularly to such pads shaped to accommodate a particular fashionable design of a feminine garment, known as a thong.

BACKGROUND ART

There is a plethora of sanitary pad or napkin designs to solve a wide variety of problems related to the reception, containment and disposal of the menstrual fluid issuing from a woman during the days of the menstrual period. For example, in the prior art expounded upon in U.S. Patent No. 4,687,478 issued August 18, 1987 to Kees J. Van Tillburg, et al. and assigned to The Procter & Gamble Company and his later patent based on the same application, U.S. Patent No. 5,267,992, issued December 7, 1993, there is disclosed a sanitary napkin of a particular shape with two side flaps extending outwardly from the absorbent means, each flap being associated with said absorbent means along non-linear lines of juncture. The patent is of interest for its exposition of the prior art and the problems contained therein. Those problems include reception of the fluid and containment of the fluid; comfort of the wearer; problems regarding retention of the napkin within the garment of the wearer as well as protection of those garments from staining. The problems also include deformation of the napkin due to conformance of the napkin with the body of the wearer. Those patents disclose, among other things, a shape of the absorbent means in which the width at its center is less than the width of its ends. The attempt is to contour this shape so it is closely attuned to the anatomical dimensions of the crotch region of the user. This ostensibly makes the sanitary napkin more comfortable to wear while, at the same time, making it more effective by rendering it less subject to compression by the legs of the user. For example, in U.S. Patent No. 4,687,478, it is stated in column 5, lines 63 et seq.,

"It is preferred that the width of the central absorbent pad 212 between lines of juncture 226 and 226' at their nearest approach be from 1 to about 8 centimeters. The width of the central absorbent pad 212 at its ends should be from about 2 to 9 centimeters. Central absorbent pad

- 2 -

212 should be from about 7.6 to about 38 centimeters long."

Not only is it difficult to describe in such dimensional terms a device which is worn by all manner of humans in terms of their dimensions, but also, the 5 description of this device in connection with the clothing which is to be worn by these people at the time they are wearing the device, is even more complicated. For example, at column 7 of the '478 patent beginning at line 67, it is stated:

"Total flexibility of flap 224 permits flap 224 to be positioned around the edge of the crotch portion of a 10 panty without having to alter the natural path of the edge of the crotch portion of the panty. Thus, the edge of the crotch portion of a panty need not be stretched to fit the second flexible axis of the flap."

The patentee goes on to describe the undergarment of the type 15 commonly worn by many women and well known as a panty. It comprises a front section, a back section, a crotch portion which joins the front and back sections; said crotch portion comprising two side edges and a center crotch portion. Column 9, lines 40 to 45.

The patentee then goes on to define the interaction of the garment with 20 the napkin, stating in column 10 beginning at line 11, "the edge of the crotch portion of the panty generally contains an elastic material. When a panty is worn, the elastic of the edge of the crotch portion generates an upward force, i.e., against the body due to the energy in the elastic and the fit of the panty. In accordance with this invention, the placement of a folded up wing portion on each side of the napkin between the body 25 and the edges of the crotch portion of the panty results in an upward force generated by the edge of the crotch portion of the panty, pushing a portion of the flaps containing the second axis of flexibility snugly against the body. This results in a gasket-like seal being formed along the axis of flexibility between the flaps and the bottom. This is illustrated in Figure 7 of the patent.

30 The above description is provided to show that the prior art is highly developed in its knowledge and understanding of this device and its interaction with the persons who are using this device for its intended purpose and their garments.

- 3 -

- Sanitary napkins come in a wide variety of shapes, such as oblong, as shown in U.S. Patent No. 4,556,146 issued December 3, 1985 to James L. Swanson; the double-flared shape shown in the patents just mentioned and U.S. Patent No. 4,950,264 issued August 21, 1990 to Thomas W. Osborne, III and his U.S. Patent No. 5,009,653 issued April 23, 1991, as well as Design Patent No. 215,386 issued September 23, 1969 to Jacob A. Glassman. Oval shapes are also known, such as that shown in Design Patent 240,562 issued July 13, 1976 to Howard A. Whitehead, et al., as well as their Design Patent No. 240,563 issued July 13, 1976, and Howard A. Whitehead's Patent No. D247368 issued February 28, 1978.
- 10 Other shapes include the trapezoidal shape shown in U.S. Design Patent D236385 issued August 19, 1975 to Robert Celander, et al., and U.S. Patent D240564 issued July 13, 1976 to Howard A. Whitehead, et al. and the modification of the trapezoid shown in D191649, dated October 24, 1961, which shows the trapezoid with extensions of the type which would extend up the abdomen in the front and to the area 15 between the buttocks in the rear; and the irregular shape of a napkin shown in U.S. Design Patent No. D234162 patented January 21, 1975 by Find Anderson.

- Other attempts to contain the fluid combine the sanitary napkin with a tampon as, for example, is shown in U.S. Patent 5,383,868 issued January 24, 1995 to Kwang H. Hyun and the interlabial sanitary pad described in U.S. Patent 5,484,429, 20 issued January 16, 1996 to Kimberly-Clark Corporation in the names of J.P. Vukos, et al.

- Another product currently being marketed under the name "FRESH'N FIT PADETTE" provides a pad for interlabial use without intervaginal insertion. This and other interlabial or intervaginal devices carry a known risk of Toxic Shock 25 Syndrome (TSS).

Many of these napkin designs include adhesive means to attach portions of the napkin to the clothing so that the napkin is not dislodged during use.

SUMMARY OF INVENTION

- Heretofore panty shields available on the market were designed to fit a 30 traditional full-sized woman's underwear panty. I have noted that the design is extremely uncomfortable for the growing population of women who wear thong-shaped panties and bathing suits. The back portions of the available panty shields or napkins

- 4 -

is too large to fit within a thong-shaped fashion garment, consequently, lumping, folding and sticking outside of the garment.

To define a thong fashion from the rear is a relatively difficult task; although well known to the eye of the beholder. In general, a regular panty will 5 embrace along its edges a portion of the thighs of the wearer. A more modified cut is known as the Rio cut in which the edges of the panty from the rear do not embrace the thighs, but rather bisect a portion of the buttocks. The thong style (also referred to as "Tonga"), however, minimizes the material between the crotch and the upper portion of the buttocks and does not flare out over any portion of the buttocks until it appears 10 from therebetween prior to its attachment to the waistband used.

Hence, I have noted that pads would have to be custom cut in order to fit comfortably in a thong style garment.

Accordingly, there are several objects and advantages of my feminine sanitary pad invention which is designed to fit within a thong style garment. It is one 15 object of the thong pad in accordance with my invention that it be much more convenient. The pad shape will not be required to be individualized or custom-cut from a prior art napkin. Pads that a woman may carry in her purse to have on hand would not require precutting to fit comfortably when used, because the thong garment pad would already be cut to size for such a garment. This will eliminate the waste of 20 time in the cutting procedure and the wondering if a "guess" fit will be accurate. Further, such custom cutting normally destroys the efficacy of the devices which have been designed for other purposes, not for fitting into a thong garment.

Secondly, the thong garment pad is designed to eliminate the lumping, folding, and random sticking out from the thong garment which would occur if the 25 current form of panty pad were worn along with the thong garment. This considerably improves the appearance when applying the pad within the thong garment; as well as improving the comfort of the wearer.

The principal advantage, of course, is in the use of this device to allow the modern woman to expand the styles of underwear and other garments she wishes to 30 use at the time of the month when she needs a sanitary napkin. This is dramatically opposed to the prior art which was designed only to be useful in traditional underwear shapes.

- 5 -

Accordingly, it is an object of this invention to provide a sanitary napkin or pad for use with a thong-shaped garment which provides the same degree of confidence in the actual protection being provided as in other panty shields or sanitary napkins, without jeopardizing fashion and style or risking the health of the user (as in 5 the case of the tampon or interlabial device) and which ultimately eliminates all the following scenarios:

- Many women during certain times of the month will change their normal fashion because there is no product available on the market to comfortably fit in the thong and french-cut styles that will provide exterior protection;
- 10 Many women will decide not to change their fashion, thus only having the option of insertable protection such as tampons or other interlabial pads, with their attendant, proven risk and discomfort; and
- 15 Destroying the utilitarian value of such protects by cutting up an existing pad in order to customize the available exterior protection products to fit a woman's thong-styled garment comfortably.

SUMMARY OF THE INVENTION

In accordance with my invention, the pad has a bulbed anterior shape which tapers to a narrow, posterior shape of substantially uniform width, to provide exterior feminine protection not found in the prior art.

20 My invention comprises a sanitary napkin or pad having an overall V-shape in plan view, bulbed at a first top end and tapering in contour therefrom longitudinally to an elongated lower end portion remote from said first top end and narrower than said first top end; said contour being generally V-shaped such that said second end is at the vertex of said V-shape. Most preferably, the napkin contour is 25 further defined along longitudinally extending peripheral curvilinear edges concave from the first end toward the second end and terminates in a rounded vertex. I also contemplate that the profile of said napkin taken in a plane parallel to the longitudinal side of said napkin is defined by variations in thickness from one longitudinal end to the other to provide additional protection. The first bulbed end is preferably thicker to 30 serve as a reservoir for fluid wicked up by the second end. The second end is preferably of uniform width.

The tapering design and narrow uniform width at the second end offers a

- 6 -

slender cut to comfortably and precisely fit in thong style garments, so that women can continue to wear all fashions during their menstruation period.

From what will be described, it will be apparent that this product will also work perfectly well in all conventional and foreign fashions and provide the protection and confidence afforded by the prior art pads, and therefore can basically take the place of many prior art devices in many cases.

DISCLOSURE OF THE INVENTION

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is a perspective view of a typical prior art thong style garment;

10 Figure 2 is a perspective view of a typical prior art thong style garment showing the potential wearer in phantom lines, to show positioning of the garment with a prior art device applied between the wearer and the garment.

15 Figure 3 is an elevation of the rear view of the prior art device shown in Figure 2 applied to a prior art thong style garment; with the resulting effects shown when the thong is worn by a person as shown in phantom lines;

Figure 3a is a rear view similar to Figure 3, but with another prior art panty garment shown in full view;

Figures 4 A, B and C show three plan views of the devices in accordance with my invention of different sizes;

20 Figures 5 A, B and C show left side views, that is, profiles of the devices shown in Figures 4 A, B and C, respectively;

Figure 6 is a perspective view of a thong panty shield in accordance with a preferred embodiment of my invention shown disposed in place as it would be used by a wearer of a thong styled garment (also shown); and

25 Figure 7 is a top view of the device and garment shown in Figure 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a perspective view of a basic thong styled garment designated generally 10. This garment normally has minimal material forming the strap 12 between the crotch 14 and waistband 16 in what is the rear R of the garment. That 30 material 12 is of a narrow uniform width over most of its length. The front 18 of the garment is normally tapered and of such a width that it will only cover a portion of the abdomen of the wearer. Normally, the edges do not extend completely across the

- 7 -

abdomen to the line of intersection between the thighs and the abdomen of the person. Any type of waistband and connection between the front and back may be used in such a thong garment. The G-string 16 is shown merely for purposes of illustration. It will also be known in the prior art to expand the amount of material at the top 17 of the
5 strap 12 where it joins the G-string 16 in the rear, while still maintaining the narrow band up to that point; the purpose being to expose as much of the buttocks as possible.

It will be appreciated by those in the fashion industry and those who buy such garments, that the normal, full panty comes with material extending down to the thigh on either side of the buttocks and that the so-called Brazilian or Rio cut has
10 material which extends only across a portion of the buttocks up to the waistband.

In Figure 2, there is illustrated the situation in which a thong style garment is worn with the usual type of prior art panty shield as, for example, disclosed in a number of the prior art patents described hereinabove. Those napkins, designated generally 20, are in an elongated shape with an absorbent portion having wider ends 22 and 24 than the narrower center 26. As will be apparent, the terminal portions of the wider ends 22a-22b in the buttocks portion considerably overlap the vertical strap 12 of the thong garment 10. This results in the situation shown in Figure 3 wherein once the garment 10 is put on with the napkin 20 in place, there is a large overhang 22a-and 22b on either side of the strap 12 of the garment. Indeed, many prior art devices are
15 designed to wrap around the crotch portion of the garment. Thus, the upper portions of the rear extension of those sanitary napkins would bunch up, once they were forced between the buttocks. Indeed, thong garments are made such that the rear strap fits closely against the body of the user and between the buttocks of the user from the crotch up almost to the waistband. This is contrasted with prior art panties which have
20 material from the waistband down to the thighs or even the Brazilian or Rio cut designated generally 25 as shown in Figure 3a, in which the material extends from the waistband across a portion of the buttocks.

Figure 6 shows a perspective view of the pad designated generally 30 in accordance with the preferred embodiment of my invention, in place within a thong
30 garment 10. Figures 4 A, B and C show three variations of that pad varying in accordance with size, but not necessarily in accordance with the overall shape. From those figures, it will be apparent that the portion of the sanitary napkin which would

- 8 -

normally cover the vaginal area is wide enough and extended long enough to cover that area comfortably, while being narrow enough at the lower end so as not to exceed the physical restraints of the size of the thong-shaped garment. Thus, from the widest or top end portion designated generally 32, the periphery of the pad is concave inwardly 5 along both longitudinal edges, as at 34, 36 and tapers longitudinally to an elongated lower end portion or second end designated generally 35 in Figure 7. The second end, portion 35, is more preferably of a substantially uniform width. At its longitudinal end, it is preferably rounded as shown at 38 and is designed to terminate just at the apex of the V-shaped pad. That is to say, it is designed to terminate beyond the lower most 10 portion of the vagina.

The design of the end portion 35 is considerably different than the bulbed portion 33 in Figure 7. It tapers much more quickly to a uniform width W and more narrowly to its termination than prior art devices. In sum, this design is configured to fit precisely within thong garments, such as thong style panties or bathing 15 suits.

In accordance with my invention, it is desired to provide such a device in various sizes, such as small, medium and large as illustrated in profile Figures 5 A, B and C. Within each size, it is possible (within the scope of my invention) to provide different thicknesses for, such as mini, regular and maxi-pad protection. Further, those 20 thicknesses can vary along the length of the device as also shown in Figures 5 A, B and C.

Referring to Figure 7, the pad in accordance with the preferred embodiment of this invention is shown looking down from above in plan view disposed in position in the garment. Assuming for purposes of illustration and description that 25 the elastic waistband 16 of the garment is positioned on the waist of the wearer substantially in a horizontal plane, then the crotch portion, designated generally by the arrow 15, would terminate on the center line CL. From that point of termination, the strap 12 extends and has a substantially uniform width up the back of the garment a substantial distance before being flared out close to the top of the back, for joining 30 with the waistband 16, as clearly illustrated. That portion of the pad which fits on the front lower portion of the abdomen and groin area (designed generally 33) is bulbed to provide the maximum amount of absorbent material and still be within the confines of

- 9 -

the garment. The portion of the pad 30 which is beyond the center line CL and is of substantially uniform width W is designed, in the most preferred embodiment, to extend in length L at least 10 millimeters beyond the center line CL. This length L is designed to be positioned beyond the lower most portion of the vagina of the wearer.

- 5 Dimension L is most preferably greater than 10 millimeters and can extend upward a considerable length in uniform width W to accommodate the thong design. Thus, it may extend a distance of say, for example, 80 millimeters as deemed desirable. In that case, the pad would be positioned well below and beyond the vagina and up the back of the wearer in the same position as the strap 12. According to my invention, the
10 structure of the pad has a first top end having a predetermined width and tapers therefrom longitudinally to an elongated lower end portion 35, Figure 7, terminating in a second end remote from said first end; said elongated lower end portion having a substantially uniform width preferably in the range of about 10 to 18 millimeters and extending longitudinally for at least about 10 millimeters to the terminus of said second
15 end. In the preferred embodiment, the elongated lower end portion 35 is most preferably less than 25% of the width of said bulbed first end portion 33.

- In the known manner, the pad is composed of one or more absorbent layers; the one layer closest to the body transfers fluid away from the body side and can wick it up into the bulbed portion by, for example, having continuous fibers
20 extending from the second end to the top end. Also, as is known in the prior art, a non-absorbent outer layer is commonly provided to retain the absorbed fluid and not let it pass through to the garment.

- It is further possible with this invention to have it retained within the confines of the garment in the usual fashion by applying adhesive means, not shown,
25 but known per se.

METHOD OF OPERATION

- In operation, the sanitary napkin in accordance with this invention is placed on the wearer within the thong garment in such a position as to fit comfortably across the lower abdomen of the person wearing the thong with the narrowest tip
30 portion located beyond the lowest portion of and externally of the vagina of the wearer. as shown in top view Figure 7. While the device will stay in place, it may also have adhesive means attaching it to the inner fabric of the thong garment. Further, it is

- 10 -

noted that because there are no extended transverse or lateral panels on this device, it will be less likely to move from the position in which it is inserted; nor will there be any bunching up or overhand beyond the garment itself.

Thus, the invention provides comfort and ease of use, and, at times, 5 extends to many women who would not otherwise use thong garments during the time of their period, the option of having such garments available to them.

- 11 -

C L A I M S

1. A feminine sanitary pad having one or more absorbent layers for use in absorbing menstrual fluids of a female wearer of the pad, said pad specifically adapted and configured to fit externally of the vaginal opening of said female wearer and extend rearwardly beyond the lowermost portion of the vagina of said female, the configuration of said pad being an overall V-shape in plan view, bulbed at a first top anterior end portion having a predetermined width, and tapering therefrom longitudinally to an elongated lower posterior end portion which terminates in a second end, remote from said first end, said elongated lower posterior end portion having a substantially uniform width over the greater portion of its length.
5. The pad of claim 1, wherein said elongated lower posterior end portion extends longitudinally for about at least 10 mm. to said second end.
10. The pad according to claim 1, wherein the pad has a contour which is defined along longitudinally extending peripheral curvilinear edges concave from the first anterior end portion to the lower posterior end portion.
15. The pad according to claim 1, wherein said second end terminates in a rounded vertex.
20. The pad according to claim 1, wherein said pad has a side view profile that varies in thickness from one end to the other end.
25. A pad according to claim 1, wherein the elongated lower posterior end portion has a substantially uniform width, being less than twenty-five percent of the width of said bulbed first anterior end portion.
30. A pad according to claim 2, wherein the elongated lower posterior end portion has a substantially uniform width, being less than twenty-five percent of the width of said bulbed first anterior end portion.
35. A pad according to claim 1, wherein said elongated lower posterior end portion has a substantially uniform width in the range of about 10mm to 18mm.
40. A pad according to claim 1, wherein said elongated lower posterior end portion extends longitudinally for a distance greater than one third, but less than one half of the total length of the pad from longitudinal end to end.
45. A feminine sanitary pad having one or more absorbent layers for use in absorbing menstrual fluids of a female wearer of the pad, said pad specifically adapted

WO 97/39713

- 12 -

- and configured to fit externally of the vaginal opening of said female wearer and completely within the confines of a thong-shaped garment being worn by said female, said garment having a narrow elongated portion of material which extends in substantially uniform width from a crotch portion substantially up the back of the 5 garment, said pad to be positioned within said garment to extend upwardly along the inside/front of said thong garment, from the crotch of the wearer, and extend rearwardly beyond the lowermost portion of and externally of the vagina of said female, the configuration of said pad being an overall V-shape in plan view, bulbed at a first top end having a predetermined width, and tapering therefrom longitudinally to 10 an elongated lower end portion which terminates in a second end, remote from said first end, said elongated lower end portion having a substantially uniform width over the greater portion of its length.

1/7

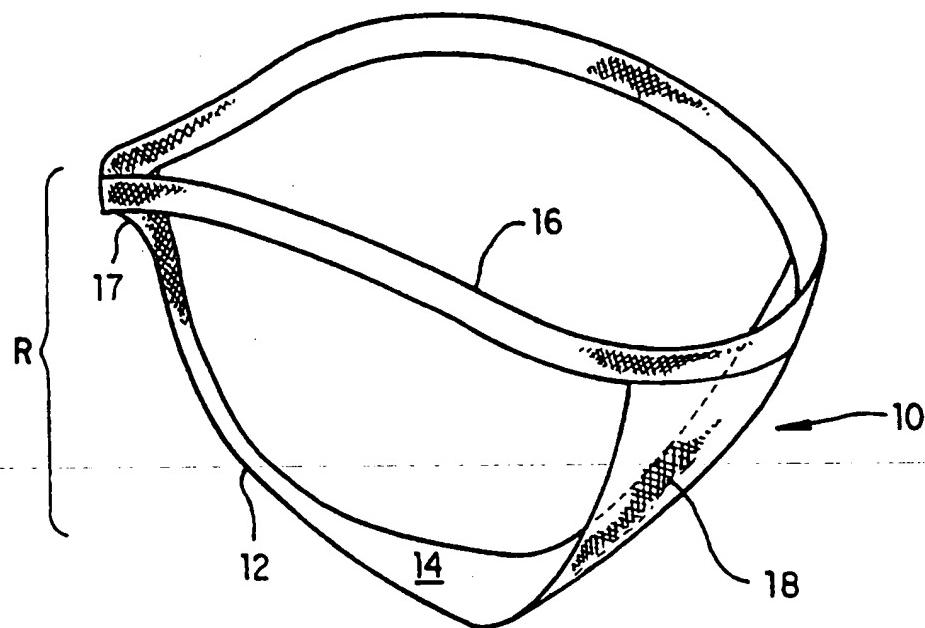


FIG. 1 PRIOR ART

2 / 7

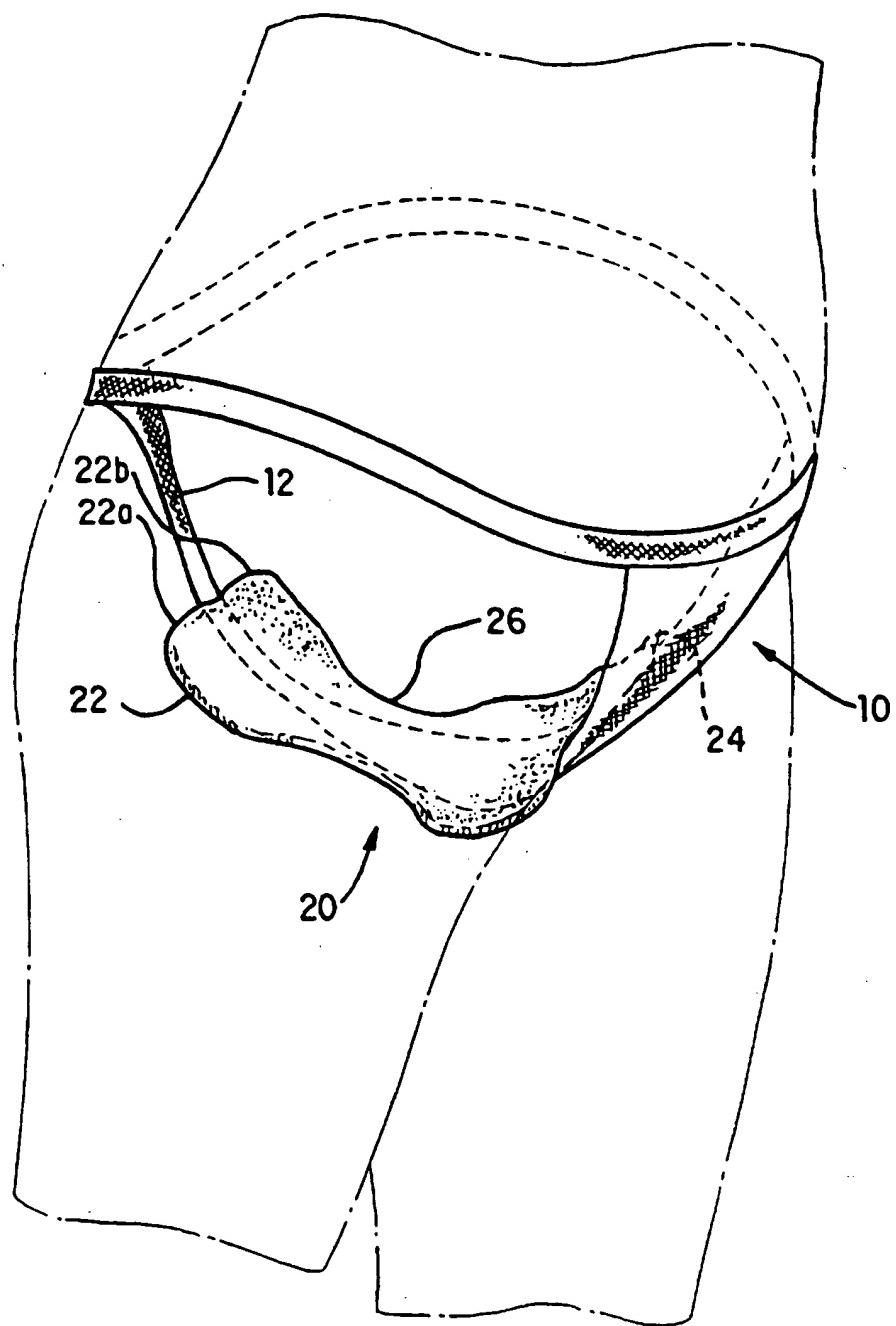
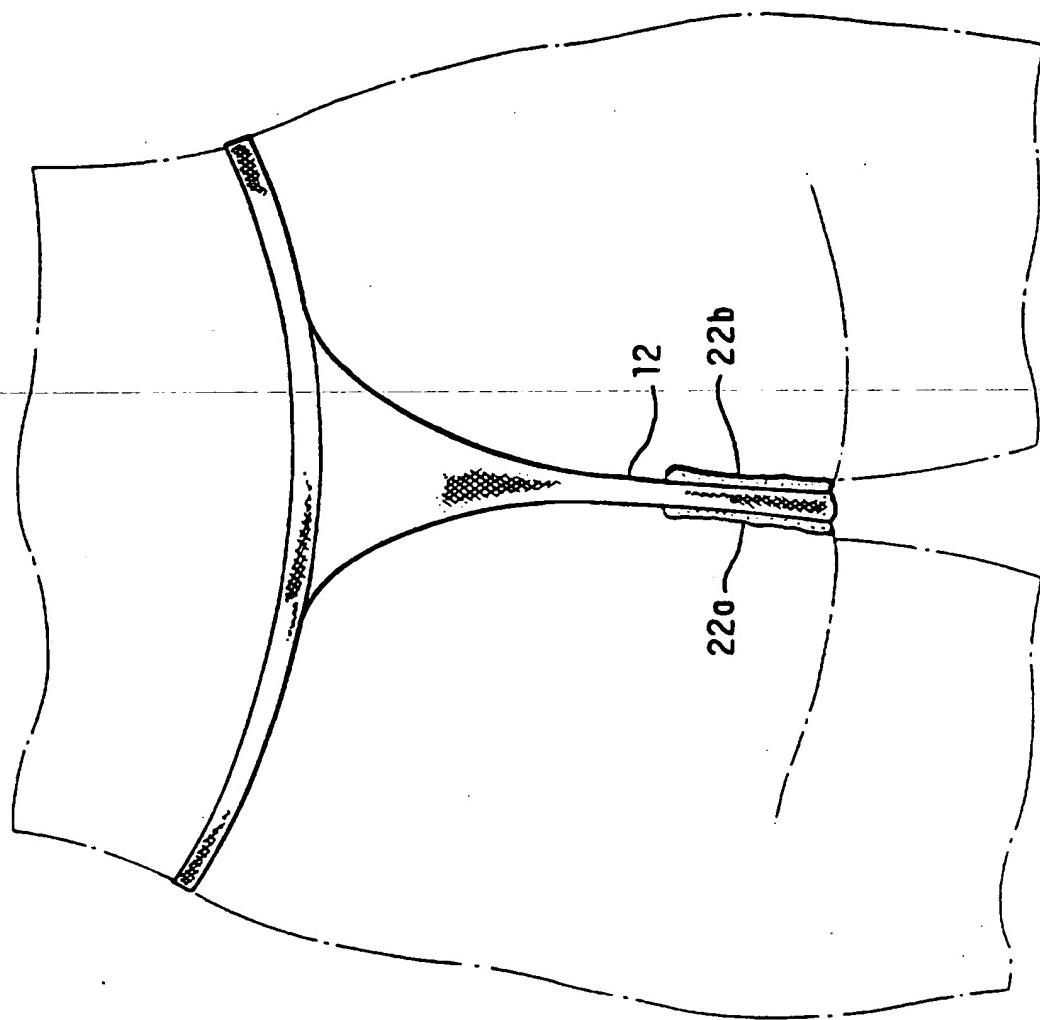


FIG. 2 PRIOR ART

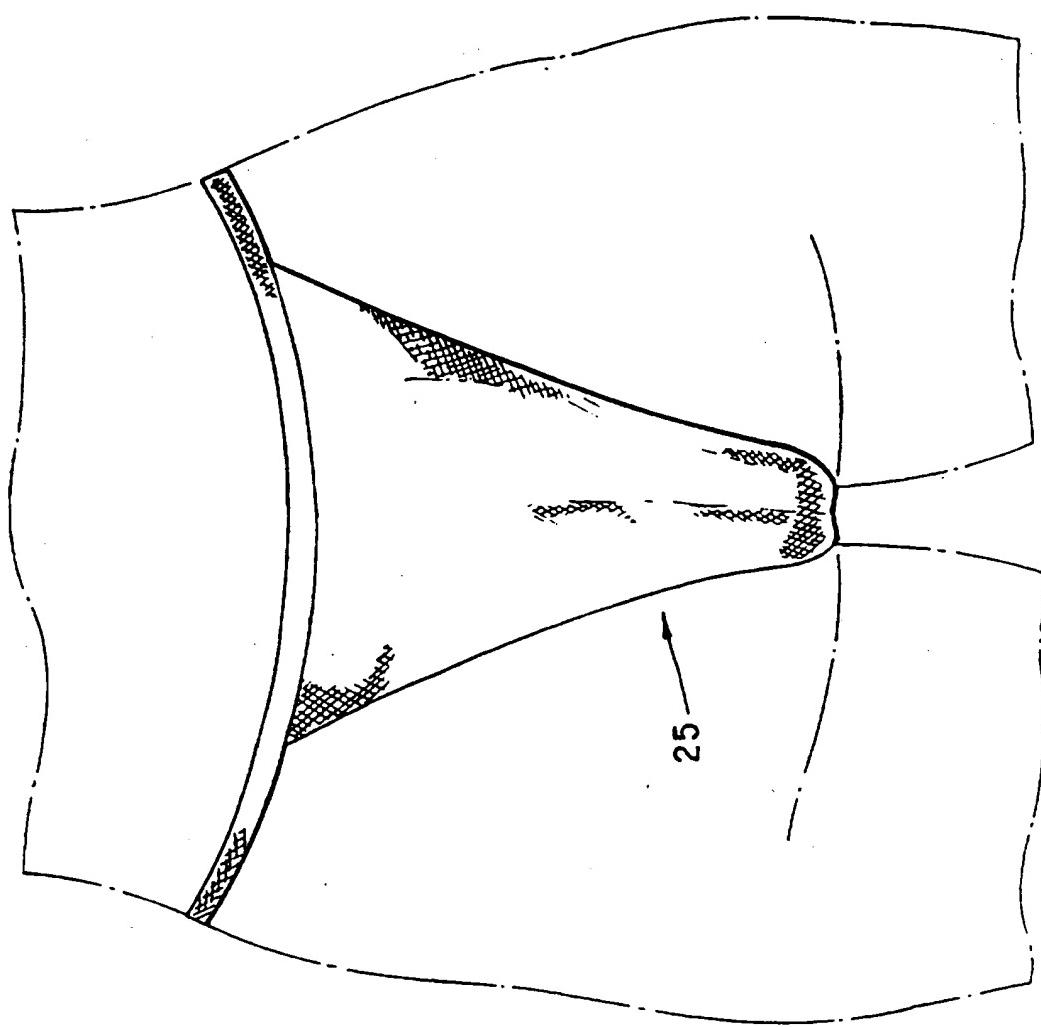
3 / 7

FIG. 3 PRIOR ART



4 / 7

FIG. 3a PRIOR ART



5 / 7

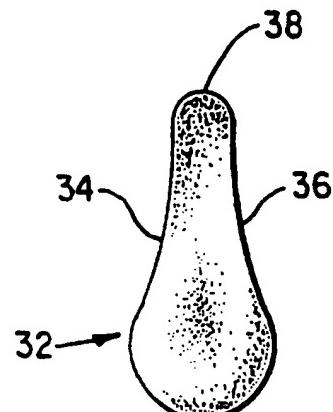


FIG. 4A

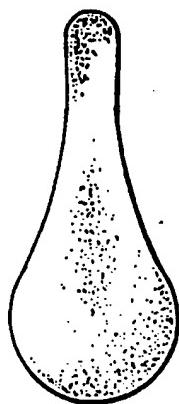


FIG. 4B

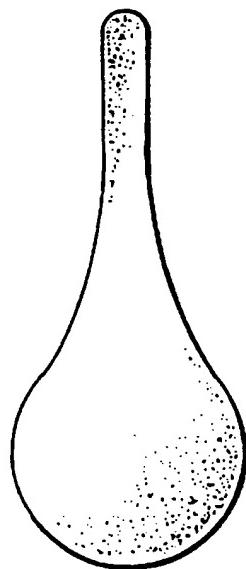


FIG. 4C



FIG. 5A



FIG. 5B



FIG. 5C

6 / 7

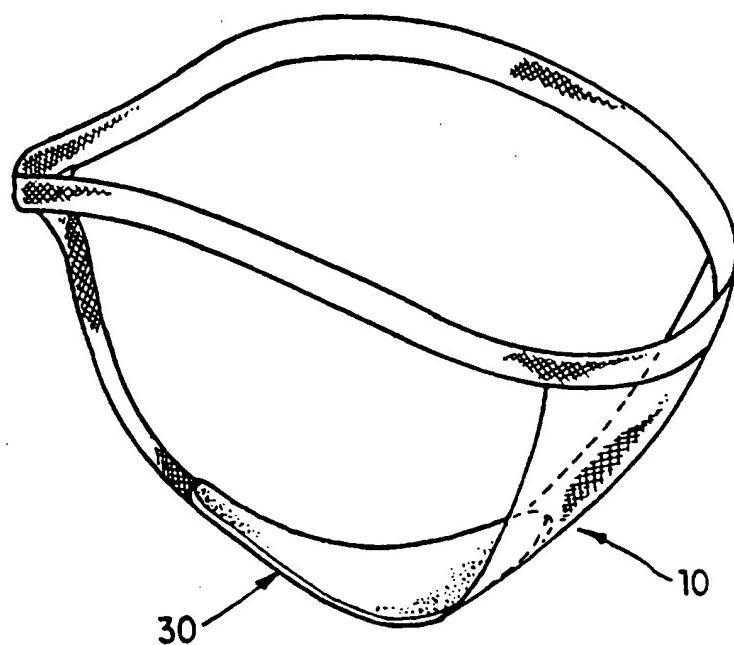


FIG. 6

7 / 7

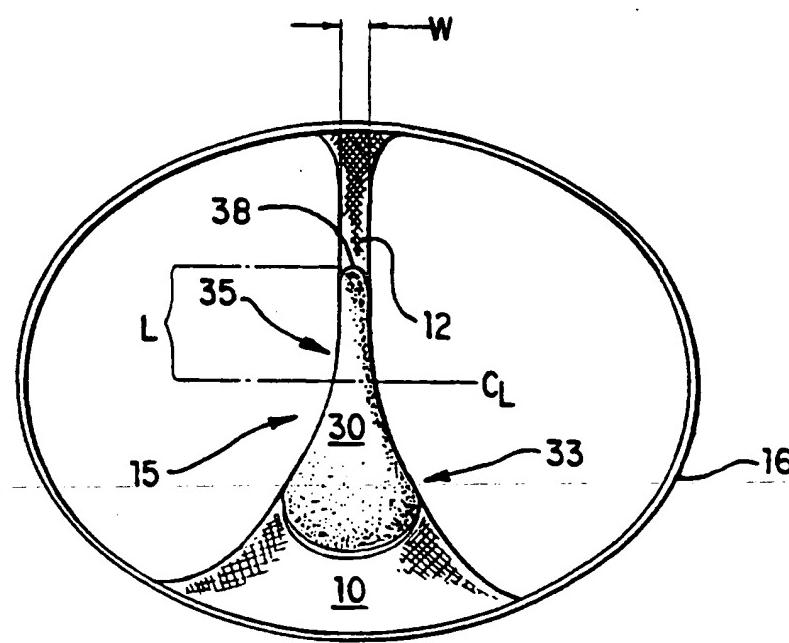


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/06826

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : A61F 13/15, 20

US CL : 604/385.1

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 604/385.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,241,710 A (LOCKHART) 07 September 1993, Fig. 4.	1-10
A	US 4,804,380 A (LASSEN et al) 14 February 1989.	1-10

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	
"A"	document defining the general state of the art which is not considered to be of particular relevance
"E"	earlier document published on or after the international filing date
"L"	document which may throw doubt on priority claimed or which is cited to establish the publication date of another citation or other special reasons (as specified)
"O"	document referring to an oral disclosure, use, exhibition or other means
"P"	document published prior to the international filing date but later than the priority date claimed
"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"Z"	document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 JUNE 1997	17 JUL 1997
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer <i>Adeline Smith for</i> KI YONG O
Faxsimile No. (703) 305-3230	Telephone No. (703) 308-2681